# TABLE OF CONTENTS

MEETING OVERVIEW	1
OPENING	1
AGENDA	2
THE PROCESS	3
AGENDA and REPORTS	4
Figure 1. Statistical areas used for catch monitoring in offshore fisheries in the Northeast United States	5
Figure 2. Offshore sampling strata used in NEFSC bottom trawl surveys	6
A. LONGFIN SQUID	7
TERMS OF REFERENCE	7
EXECUTIVE SUMMARY	7
INTRODUCTION	9
DATA  Landings  Discarded catch  Landings per unit of commercial fishing effort (LPUE)  Bottom trawl survey data	. 11 . 12 . 13
NEFSC surveys  Massachusetts inshore survey  Survey coverage	. 13 . 14 . 14
Adjustments for diel catchability differences  Survey data computations  Survey results	. 16

ASSESSMENT CALCULATIONS	17
Length-based virtual population analysis	
Growth and $\Delta t_L$ values	
Natural mortality rate	
LVPA calculations	18
LVPA catch data	19
LVPA results	19
Bounds for Q in assessment models for longfin squid	20
Factors affecting autumn survey catchability	20
Bounds for effective tow distance (d)	
Bounds for effective trawl width (w)	
Bounds for effective stock area (A)	
Bounds for survey bottom trawl efficiency (e)	
Bounds for Q <sub>Fall</sub> =dwe/A	24
Statistical distributions for uncertainty	25
Scaled catch-survey model	
Relative exploitation rates for other surveys	
Catch-survey results	
Production modeling	
Logistic surplus production population dynamics	
Simple production population dynamics (without K)	
Process errors and variability in r <sub>t</sub>	
Abundance data	
Process errors in bottom trawl survey catchabilities	
Goodness of fit for each component	
Objective function	
Variance and confidence interval calculations	
PDQ model configuration for longfin squid	
LVPA biomass "data"	
Status variables	
Gauging goodness of fit - how much is enough?	
Pseudo - ASPIC runs	
Likelihood profile calculations with the simple model	
The trouble with production models for longfin squid - a hypothesis	
Simple model with independent production process errors	
Models with catchability process errors	
Traditional per recruit calculations	39
OVERFISHING DETERMINATION	41
SARC COMMENTS	42
RESEARCH RECOMMENDATIONS	43
ACKNOWLEDGMENTS	44

	REFERENCES	45
	TABLES: A1 - A21	47-66
	FIGURES: A1 - A45	67-111
В. (	GEORGES BANK WINTER FLOUNDER	113
	TERMS OF REFERENCE	113
	SUMMARY	113
	INTRODUCTION Stock Structure Fishery Description Management History	114 115
	THE FISHERY  Commercial Landings  Commercial Discards  Sampling Intensity of Commercial Landings  Landings at Age  Mean Weights at Age	
	STOCK ABUNDANCE AND BIOMASS INDICES  U.S. Landings per Unit of Effort Indices  U.S. Research Vessel Bottom Trawl Survey Indices  Canadian Research Vessel Bottom Trawl Survey	120 121
	MORTALITY AND MATURATION  Natural Mortality  Total Mortality  Maturity	122 122

ESTIMATES OF STOCK SIZE AND FISHING MORTALITY	
Virtual Population Analysis	
Forward Projection of Catch at Age	
Tormand Trojection of Caren at rige	
BIOLOGICAL REFERENCE POINTS	
Current	
Proposed	126
PROJECTIONS	126
CONCLUSIONS	126
SARC COMMENTS	127
britte comments	
SOURCES OF UNCERTAINTY	128
RESEARCH RECOMMENDATIONS	129
REFERENCES	130
TABLES: B1 - B28	133 -161
	1.00 1.00
FIGURES: B1 - B19	162 - 179
C. GOOSEFISH	181
TERMS OF REFERENCE	181
INTRODUCTION	101
INTRODUCTION	101

FISHERY DATA	182
U.S. Landings	182
Foreign Landings	184
Size Composition of U.S. Landings and Catch	
Discard Estimates	185
Catch per Unit Effort by Gear and Depth	185
Selectivity of Trawls and Scallop Dredges	
RESEARCH SURVEY ABUNDANCE AND BIOMASS INDICES	
NEFSC Survey Indices	
Northeast Region	
Southern Region	
Management Areas Combined	
MA DMF Survey Indices	189
2001 COOPERATIVE GOOSEFISH SURVEY METHODS	
Methods	189
RESULTS - COOPERATIVE GOOSEFISH SURVEY EXPERIMENTAL TOW	S191
RESULTS - COOPERATIVE GOOSEFISH SURVEY	191
RELATIVE PRECISION OF F/V COOPERATIVE SURVEY AND	
COMPARISONS WITH NMFS RESEARCH TRAWL SURVEY	193
Methods	
Comparisons with NMFS R/V Trawl Surveys	
EGG PRODUCTION INDICES FROM NEFSC SURVEY LENGTH	
COMPOSITION DATA	196
ESTIMATION OF MORTALITY AND STOCK SIZE	196
Natural Mortality Rate	
Mortality estimates from NEFSC Surveys	
Yield Per Recruit	

BAYESIAN SURPLUS PRODUCTION MODEL ANALYSES	
EVALUATION OF STOCK STATUS WITH RESPECT TO REFERENCE POINTS  Northern Region Southern Region Trends in stock biomass, recruitment, and mortality	. 202 . 202
SARC COMMENTS	. 203
RESEARCH RECOMMENDATIONS	. 204
LITERATURE CITED	. 205
TABLES: C1 - C49	- 251
FIGURES: C1 - C87	- 346

The Stock Assessment Review Committee (SARC) meeting of the 34<sup>th</sup> Northeast Regional Stock Assessment Workshop (34th SAW) was held in the Aquarium Conference Room of the Northeast Fisheries Science Center's Woods Hole Laboratory, Woods Hole, MA during November 26-30, 2001. The SARC Chairman was Dr. Robin Cook, Aberdeen Marine Laboratory. Members of the SARC included scientists from the NEFSC, the Northeast Regional Office (NERO), the New England Fishery Management Council (NEFMC), the Mid-Atlantic Fishery Management Council (MAFMC), the University of Rhode Island, the Woods Hole Marine Biological Laboratory, Atlantic States Marine Fisheries Commission (ASMFC), and the Canadian Department of Fisheries and Oceans (Table 1). Support for Drs. Cook and Mohn was provided by the Center for Independent Experts, University of Miami. In addition, 52 other persons attended some or all of the meeting (Table 2). meeting agenda is presented in Table 3.

## Table 1. SAW-34 SARC Composition.

Chairman, Robin Cook (FRS, Aberdeen, UK)

NEFSC, NMFS Regional Office Russell Brown, Jay Burnett Loretta O'Brien, Bill Overholtz, John Witzig

Regional Fishery Management Councils
Andrew Applegate, NEFMC
Richard Seagraves, MAFMC

Atlantic States Marine Fisheries Commission/States: Megan Gamble, ASMFC - Gary Nelson, MA

Other experts:

Joseph DeAlteris (URI), Roger Hanlon (MBL)
Bob Mohn (DFO/BIO, Halifax)
Advisors:
Kathy Downey, Jack Jones,
Robert Lane, Maggie Raymond

### **Opening**

Dr. Terrence Smith, Stock Assessment Workshop (SAW) Chairman, welcomed the meeting participants and briefly reviewed the overall SAW process. Dr. Cook reviewed the agenda and discussed the conduct of the meeting.

**Table 2.** List of Participants

#### NMFS, Northeast Fisheries Science Center

Frank Almeida Ralph Mayo John Boreman Henry Milliken Jon Brodziak Steve Murawski Steve Cadrin Paul Nitschke Peter Chase Paul Rago David Curelli Anne Richards Michael Fogarty Marjorie Rossman Wendy Gabriel Fred Serchuk Lisa Hendrickson Gary Shepherd Pie Smith Devorah Hart Joe Idoine Terry Smith Larry Jacobson Katherine Sosebee Ambrose Jearld Lorraine Spenle Chad Keith Sandra Sutherland Mark Terceiro Han-Lin Lai Kathy Lang Michelle Thompson Chris Legault Jim Weinberg Jason Link Susan Wigley Amy Wittingham

#### NEFMC/ASMFC/States/Industry

Sarah Babson-Pike, NERO Steve Correira, MA Steve Gorniak, Cornell Phil Haring, NEFMC Jill Jennings, Observer Bob Johnson, MA Jeremy King, MA Albert Leo, Cornell Leslie Anne McGee, NEFMC J.J. Maguire, Industry Garth Peterson, Congressional David Pierce, MA Eric Powell, Industry John Quinlan, WHOI Mark Simonitsch, Industry

Table 3. Agenda of the 34<sup>th</sup> Northeast regional Stock Assessment Workshop (SAW-34) Stock Assessment Review Committee (SARC) meeting.

Aquarium Conference Room NEFSC Woods Hole Laboratory Woods Hole, Massachusetts November 26-30, 2001

Woods Hole, Massachusetts November 26-30, 2001			
TOPIC	AGENDA WORKING GROUP	SARC LEADER	RAPPORTEUR(S)
	& PRESENTER(S)		
<b>MONDAY, 26 November</b> (1:00 - 5	5:30 PM)		
Opening Welcome Introduction Agenda Conduct of meeting	Terry Smith, S. Robin Cook, SA	AW Chairman ARC Chairman	P. Smith
Georges Bank winter flounder (E	B) L. Hendrickson	W. Overholtz	P. Nitschke
Informal reception ( <b>6:00 PM</b> ) at SWOPE Building (Marine Biological Laboratory)  TUESDAY, 27 November (8:30 AM - 6:00 PM)			
Goosefish (C)	R. A. Richards	R. Brown	C. Legault
WEDNESDAY, 28 November (8:	30 AM - 5:00 PM)		
Loligo (A)	L. Jacobson H. Lai J. Brodziak	B. Mohn	G. Shepherd
<b>THURSDAY, 29 November</b> (8:30 AM - 6:00 PM)			
Review Advisory Reports and Sections for the SARC Report			
FRIDAY, 30 November (8:30 AM	I - Noon PM)		
SARC comments, research recomm Other business	nendations, and 2nd	drafts of Advisory P. Smith	Reports

#### The Process

The Northeast Coordinating Council, which guides the SAW process, is composed of the executives of the five partner organizations responsible for fisheries management in the Northeast Region (NMFS/Northeast Fisheries Science Center, New England Fishery Management Council, Mid-Atlantic Fishery Management Council, and the Atlantic States Marine Fisheries Commission). groups assemble the data for assessments, decide on methodology, and prepare

documents for SARC review. The SARC members have a dual role; panelists are both reviewers of assessments and drafters of management advice. More specifically, although the SARC's primary role is peer review of the assessments tabled at the meeting, the Committee also prepares a report with advice for fishery managers contained in the 34th SAW Advisory Report.

Assessments for SARC review were prepared at meetings listed in Table 4.

Working Group and Participants	Meeting Date	Stock/Species
Southern Demersal Working Group J. Brodziak, NEFSC R. Brown, NEFSC S. Cadrin, NEFSC L. Hendrickson, NEFSC R. Mayo, NEFSC P. Nitschke, NEFSC L. O'Brien, NEFSC K. Sosebee, NEFSC M. Terceiro, NEFSC (Chair) S. Wigley, NEFSC	29-30 October, 2001	Georges Bank winter flounder
Southern Demersal Working Group A. Applegate, NEFMC K. Downey, Industry H. Franco, Indusy P. Haring, Industry P. Kavanagh, Industry C. Legault, NEFSC J. Maguire, Industry J. Mahoney, NERO N. McHugh, NEFSC H. Milliken, NEFSC A. Richards, NEFSC G. Shepherd, NEFSC T. Smith, NEFSC K. Sosebee, NEFSC M. Terceiro, NEFSC M. Vassal, Industry A. Wittingham, NEFSC S. Wigley, NEFSC	31 October and 2 November, 2001	Goosefish

Working Group and Participants	Meeting Date	Stock/Species (continued)
<u>Invertebrate Subcommittee</u>	26 September, 2001	Longfinned Squid
J. Brodziak, NEFSC	5-6, November 2001	
S, Cadrin, NEFSC		
C. Glass, Manomet		
L. Jacobson, NEFSC (Chair)		
C. Keith, NEFSC		
H. Lai, NEFSC		
G. Monsen, Industry		
E. Powell, Industry		
P. Rago, NEFSC		
R. Seagraves, MAFMC		

# **Agenda and Reports**

J. Weinberg, NEFSC

The SAW-34 SARC agenda (Table 3) included presentations on assessments for Georges Bank winter flounder, mnkfish, and long-finned squid.

A chart of US commercial statistical areas used to report landings in the Northwest Atlantic is presented in Figure 1. A chart showing the sampling strata used in NEFSC bottom trawl surveys is presented in Figure 2.

SARC documentation includes two reports; one containing the assessments, SARC comments, and research recommendations (this report, the

SARC Consensus Summary), and another produced in a standard format which includes the status of stocks and management advice (SARC Advisory Report). The draft reports were made available at two sessions of the SAW-34 Public Review Workshop held during regularly scheduled NEFMC and MAFMC meetings (January 15, Portsmouth NH; January 30, Secaucus NJ, respectively). The documents will be published in the NEFSC Reference Document series as the 34th SARC Consensus Summary of Assessments and the 34th SAW Public Review Workshop Report (the latter document includes the Advisory Report), after the Public Review Workshop sessions.

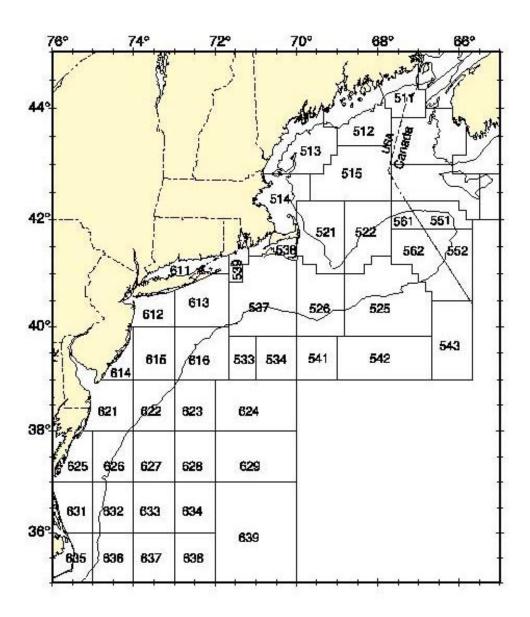


Figure 1. Statistical areas used for catch monitoring in offshore fisheries in the Northeast United States.

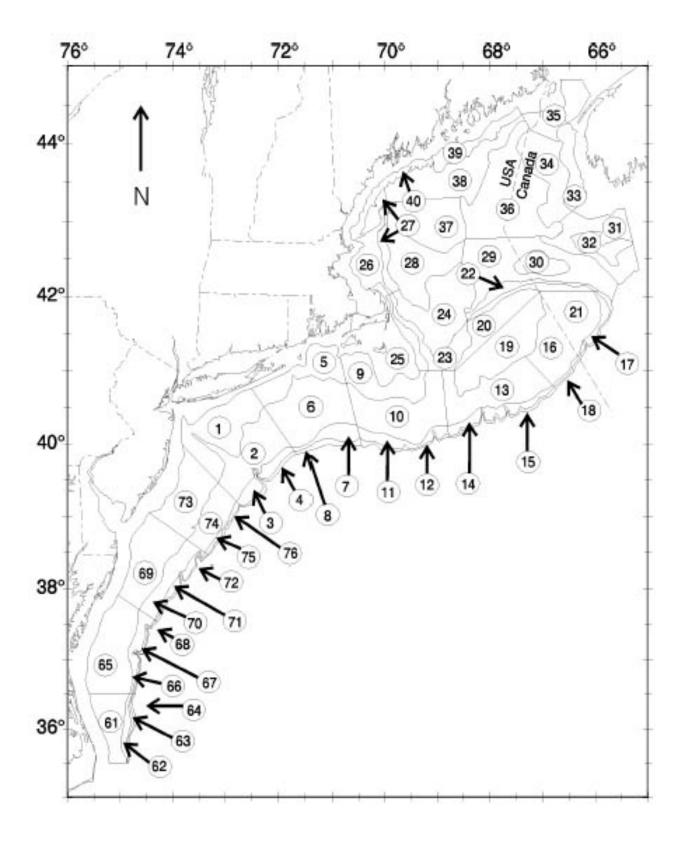


Figure 2. Offshore sampling strata used in NEFSC bottom trawl surveys.